Proposal for Pre-engineered Container BESS solution

Content

General description

The object of this proposal is the pre-engineered container energy storage system solution, most of which is packed into a 20 feet container.
This solution has integrated almost everything needed for a turnkey ESS solution, excluding battery system and energy management system.

Biography of Zhyphen

Zhyphen is the trademark and brand of Sun Harvester limited a UK company formed in 2017 with its manufacturing facility in Limavady, Northern Ireland. Zhyphen Energy Storage Systems (ESS) offer smart energy & grid solutions based on battery storage. We offer full turnkey solutions with Zhyphen proprietary software & unique modular hardware.

We provide innovative high quality ESS for harvesting and storing free low carbon renewable energy. Our technology can be applied to almost limitless applications from small 50w Mobile Units to our Mini-Grid Systems and beyond.

Zhyphen's in-house R&D facility develop unique system architecture used in all our ESS coupled with our proprietary Battery management system (BMS) ensuring maximum usable energy & sustainability.

We pride ourselves in providing future proof modular "plug and play" solutions with unrivalled build quality resulting in unsurpassed performance and profitability for our clients worldwide. At Zhyphen we believe that energy storage is a fundamental part of the world's future energy supply for both environmental & economic reasons. Energy storage solutions (ESS) allow consumers to store electricity at times of high generation and use it when demand and therefore price is highest making considerable cost savings.

Specification

3.1 40ft solution

Utility-interactive Mode	SES-4-501	SES-4-102	SES-4-152	SES-4-202
Battery voltage range	630~900V			
DC max current	873A	873A×2	873A×3	873A×4
Quantity of battery strings	1/4/8			
AC voltage	380V at PCS 480 or 400V at AC interface			
AC current	760A	1520A	2280A	6080A
Nominal power	500kW	1000kW	1500kW	2000kW
AC frequency	60Hz(59.5~60.5Hz)			

THDi	≤3%			
AC PF	Listed: 0.8~1 leading or lagging (Controllable) Actual: 0.1~1 leading or lagging (Controllable)			
Stand-alone Mode				
Battery voltage range	630~900V			
DC Max Current	873A	873A×2	873A×3	873A×4
Quantity of battery strings	1/4/8			
AC output voltage	380V at PCS 480 or 400V at AC interface			
AC output current	760A@380V (short term overload 836A max)	1520A@380V (short term overload 1672A max)	2280A@380V (short term overload 2508A max)	6080A@380V (short term overload 3344A max)
Nominal AC output power	500kW	1000kW	1500kW	2000kW
AC max power	550kW	1100kW	1650kW	2200kW
Output THDu	≤2%（Linear load）			
AC frequency	50 or 60Hz			
AC PF	Listed: 0.8~1 leading or lagging (Load-depend) Actual: 0.1~1 leading or lagging (Load-depend)			
Overload Capability	105%~115% 10min; 115%~125% 1min; 125%~150% 200ms			
Battery Requirement				
Max Capacity	2000kWh			
Chemical	Lithium ion based			
Voltage Range	630~900V @ PWS1-500KTL			
C rate	Not exceeding 2			
Physical				
Cooling	Forced air cooling for power electronics Air conditioned for battery system (No air conditioner preinstalled)			
Noise	70dB			
Enclosure	NEMA 3R			
Max elevation	3000m/10000feet (> 2000m/6500feet derating)			
Operating ambient temperature	-20°C to 50°C (De-rating over 45°C)			
Humidity	0~95% (No condensing)			
Size (W×H×D)	12192×2591×2438mm			
Weight	TBD			
Fire system				

Delays	Configurable
Manual release	Supported
Voltage	230/115V AC
Back up battery	Two 12V 7Ah lead acid in series
Sensors	Smoke detector and heat detector
Alarm	Yes
Agent container	Nominal pressure: 25 bar @ 21℃ Max pressure: 34.7 bar Hydraulic test pressure: 69.0 bar Capacity: depends
Agent	FM200 (HFC-227ea)
Certification	Controller: UL864, FM listed Strobe: UL1638 Horn: UL464

Other	
Peak efficiency for inverter	98.20%
CEC efficiency for inverter	97% w/o transformer
Protection	OTP, AC OVP/UVP, OFP/UFP, EPO, AC Phase Reverse, Fan/Relay Failure, OLP, GFDI, Anti-islanding
Configurable protection limits	Upper/Lower AC Voltage/Frequency limit, Battery EOD voltage.
AC connection	3-Phase 3-wire+PE at PCS 3-Phase 4-wire+PE at AC interconnection point
Communication	RS485, CAN, Ethernet
Isolation	Non-isolation (External Transformer Included in Container)
Certification for inverter	ETL listed conforming to UL1741/UL 1741SA/UL 9540, CPUC RULE 21, CSA 22.2

3.2 20ft solution

Utility-interactive Mode	**SES-2-501**	**SES-2-251**	**SES-2-151**	**SES-2-101**
Battery voltage range	630~900V		500~800V	
DC max current	873A	550A	330A	220A
Quantity of battery strings	1/4/8		1	
AC voltage	380V at PCS 480 or 400V at AC interface	480 or 400V at PCS and AC interface		
AC current	760A	301A	180A	120A
Nominal power	500kW	250kW	150kW	100kW
AC frequency	60Hz(59.5~60.5Hz)			
THDi	≤3%			
AC PF	Listed: 0.8~1 leading or lagging (Controllable)			

	Actual: 0.1~1 leading or lagging (Controllable)			
Stand-alone Mode				
Battery voltage range	630~900V		500~800V	
DC Max Current	873A	550A	330A	220A
Quantity of battery strings	1/4/8		1	
AC output voltage	380V at PCS 480 or 400V at AC interface	480 or 400V at PCS and AC interface		
AC output current	760A (short term overload 836A max)	301A (short term overload 331A max)	180A (short term overload 198A max)	120A (short term overload 132A max)
Nominal AC output power	500kW	250kW	150kW	100kW
AC max power	550kW	275kW	165kW	110kW
Output THDu	≤2%（Linear load）			
AC frequency	60Hz			
AC PF	Listed: 0.8~1 leading or lagging (Load-depend) Actual: 0.1~1 leading or lagging (Load-depend)			
Overload Capability	105%~115% 10min; 115%~125% 1min; 125%~150% 200ms			
Battery Requirement				
Max Capacity	1000kWh			
Chemical	Lithium ion based			
Voltage Range	630~900V @ PWS1-500KTL 500~800V @ PWS1-100/150/250K			
C rate	Not exceeding 2			
Physical				
Cooling	Forced air cooling for power electronics Air conditioned for battery system (No air conditioner preinstalled)			
Noise	70dB			
Enclosure	NEMA 3R			
Max elevation	3000m/10000feet (> 2000m/6500feet derating)			
Operating ambient temperature	-20°C to 50°C (De-rating over 45°C)			
Humidity	0~95% (No condensing)			
Size (W×H×D)	6058×2591×2438mm			
Weight	TBD			
Fire system				
Delays	Configurable			

Manual release	Supported
Voltage	230/115V AC
Back up battery	Two 12V 7Ah lead acid in series
Sensors	Smoke detector and heat detector
Alarm	Yes
Agent container	Nominal pressure: 25 bar @ 21℃ Max pressure: 34.7 bar Hydraulic test pressure: 69.0 bar Capacity: depends
Agent	FM200 (HFC-227ea)
Certification	Controller: UL864, FM listed Strobe: UL1638 Horn: UL464

Other				
Peak efficiency for inverter	98.20%	96.10%	96.10%	95.80%
CEC efficiency for inverter	97% w/o transformer	95%	94.5%	94%
Protection	OTP, AC OVP/UVP, OFP/UFP, EPO, AC Phase Reverse, Fan/Relay Failure, OLP, GFDI, Anti-islanding			
Configurable protection limits	Upper/Lower AC Voltage/Frequency limit, Battery EOD voltage.			
AC connection	PWS1-500KTL: 3-Phase 3-wire+PE at PCS All: 3-Phase 4-wire+PE at AC interconnection point			
Communication	RS485, CAN, Ethernet			
Isolation	Non-isolation (External Transformer Included in Container)			
Certification for inverter	ETL listed conforming to UL1741/UL 1741SA/UL 9540, CPUC RULE 21, CSA 22.2			

3.3 10ft solution

Utility-interactive Mode	**SES-1-501**	**SES-1-251**	**SES-1-151**	**SES-1-101**
Battery voltage range	630~900V		500~800V	
DC max current	873A	550A	330A	220A
Quantity of battery strings	1/4/8		1	
AC voltage	380V at PCS 480 or 400V at AC interface	480 or 400V at PCS and AC interface		
AC current	760A	301A	180A	120A
Nominal power	500kW	250kW	150kW	100kW
AC frequency	60Hz(59.5~60.5Hz)			
THDi	≤3%			
AC PF	Listed: 0.8~1 leading or lagging (Controllable)			

	Actual: 0.1~1 leading or lagging (Controllable)			
Stand-alone Mode				
Battery voltage range	630~900V		500~800V	
DC Max Current	873A	550A	330A	220A
Quantity of battery strings	1/4/8		1	
AC output voltage	380V (±10% configurable)	480V (±10% configurable)		
AC output current	760A (short term overload 836A max)	301A (short term overload 331A max)	180A (short term overload 198A max)	120A (short term overload 132A max)
Nominal AC output power	500kW	250kW	150kW	100kW
AC max power	550kW	275kW	165kW	110kW
Output THDu	≤2%（Linear load）			
AC frequency	60Hz			
AC PF	Listed: 0.8~1 leading or lagging (Load-depend) Actual: 0.1~1 leading or lagging (Load-depend)			
Overload Capability	105%~115% 10min; 115%~125% 1min; 125%~150% 200ms			
Battery Requirement				
Max Capacity	500kWh			
Chemical	Lithium ion based			
Voltage Range	630~900V @ PWS1-500KTL 500~800V @ PWS1-100/150/250K			
C rate	Not exceeding 2			
Physical				
Cooling	Forced air cooling for power electronics Air conditioned for battery system (No air conditioner preinstalled)			
Noise	70dB			
Enclosure	NEMA 3R			
Max elevation	3000m/10000feet (> 2000m/6500feet derating)			
Operating ambient temperature	-20°C to 50°C (De-rating over 45°C)			
Humidity	0~95% (No condensing)			
Size (W×H×D)	2991×2591×2438mm			
Weight	TBD			
Fire system				
Delays	Configurable			

Manual release	Supported
Voltage	230/115V AC
Back up battery	Two 12V 7Ah lead acid in series
Sensors	Smoke detector and heat detector
Alarm	Yes
Agent container	Nominal pressure: 25 bar @ 21℃ Max pressure: 34.7 bar Hydraulic test pressure: 69.0 bar Capacity: depends
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Other				
Peak efficiency for inverter	98.20%	96.10%	96.10%	95.80%
CEC efficiency for inverter	97% w/o transformer	95%	94.5%	94%
Protection	OTP, AC OVP/UVP, OFP/UFP, EPO, AC Phase Reverse, Fan/Relay Failure, OLP, GFDI, Anti-islanding			
Configurable protection limits	Upper/Lower AC Voltage/Frequency limit, Battery EOD voltage.			
AC connection	PWS1-500KTL: 3-Phase 3-wire+PE Other models: 3-Phase 4-wire+PE at AC interconnection point			
Communication	RS485, CAN, Ethernet			
Isolation	PWS1-500KTL: Non-isolation (External Transformer Required) Other models: Galvanic isolated			
Certification for inverter	ETL listed conforming to UL1741/UL 1741SA/UL 9540, CPUC RULE 21, CSA 22.2			

Applied codes and standards

- NFPA 70-2017 National Electrical Code®
- IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems
- UL 9540 Standard for Energy Storage Systems and Equipment
- UL 1741 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources
- CPUC RULE 21 a source requirements document (SRD) for UL 1741 SA

The power electronics, specifically the energy storage inverter, is used to converter the DC power from battery, to AC power to the AC distribution system in discharging mode, and vice versa in charging operation.
The proposed energy storage inverters are a modular designed, ETL certified bi-directional inverter.
Considering to the whole capacity of the battery that can be hold in the 20ft container, and the power/energy ratio requested by the tenderer, each energy storage unit would implement the grid is a grid-support utility-interactive inverter, which is defined as an inverter or converter intended for use in parallel with an electric utility that is a Utility Interactive inverter that it is additionally evaluated for specific grid support functions different from those defined in IEEE 1547-2003 and IEEE 1547.1-2005. These units have specific utility interconnection settings that allow them to provide grid support functionality such as voltage and frequency regulation functions and voltage and frequency ride through.

5.1 Functionalities

All Zhyphen energy storage inverter supports the following functionalities:

5.1.1 Four-quadrant operation

The energy storage inverter supports four-quadrant operation in both grid-tied mode and off-grid mode, which means the active power and the reactive power can be tuned to or showing to 4 characteristics:

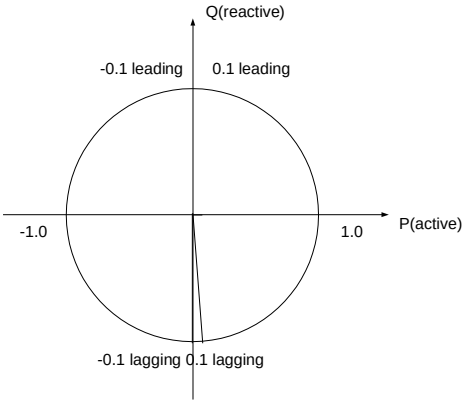
- Import active power + inductive reactive power
- Import active power + capacitive reactive power
- Export active power + inductive reactive power
- Export active power + capacitive reactive power

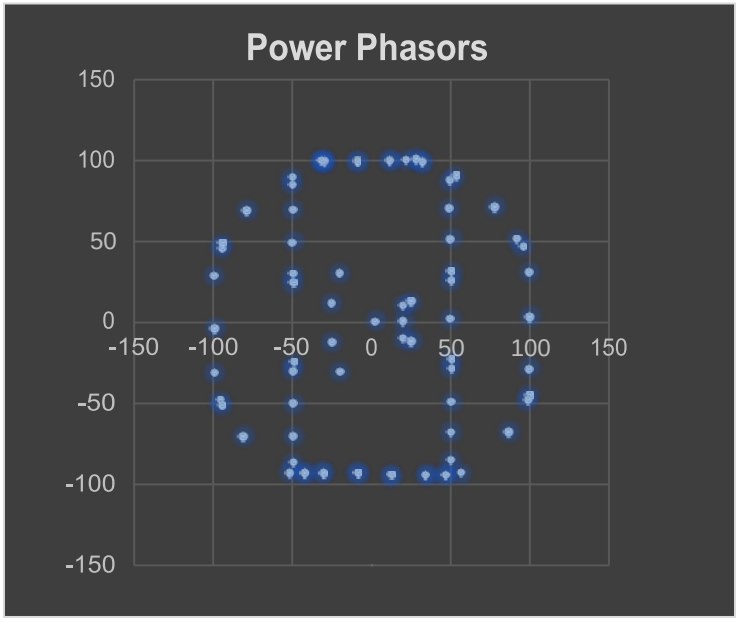
Yet the energy conversion systems always consume certain active power as the loss. The actual PF range is 0.1~1.0 leading or lagging. The sign is indicating the reference direction of the power.

5.1.2 Grid-tied Power Regulation

5.1.2.1 Utility-interactive mode (Grid-tied mode / P-Q mode)

The P-Q mode is that the reference voltage and a constant frequency will be provided by another source (usually the utility grid), and the active power and the reactive power can be commanded to change on the inverter.





5.1.2.1.1 (Reactive power control mode) Constant PF

In grid tied mode, there are 3 variables in the equation defining power factor:

$$\mathrm{PF} = \frac{PP}{\sqrt{PP^2 + QQ^2}}$$

where

P is active power,

Q is reactive power.

PF is power factor.

in constant PF mode, the active power (P), and power factor (PF) is specified by setpoint or EMS command (in PV inverters the active power is usually determined by the weather), the reactive power shall be determined with the variation of the active power setpoint. The inverters are taking reactive power priority. if the determined PF cannot be reached within the apparent capability, the active power will be reduced automatically

5.1.2.1.2 (Reactive power control mode) Constant reactive power

In constant reactive power mode, the active power (P), and reactive power (Q) is specified by setpoint or EMS, the reactive power shall be determined with the variation of the active power setpoint.

The inverters are taking reactive power priority. if the determined reactive power cannot

be reached within apparent capability with the active power setpoint, the active power will be reduced automatically.

5.1.2.2 (Reactive power control mode) Volt-VAr control

Enabling Volt-VAr control will be supplying VARs when and where demanded is inherent to operating an electric power system.
The Volt VAr function varies reactive power to counteract voltage deviations.
Specifically, in response to an increase in local voltage, the smart inverter will absorb reactive power, and in response to a decrease in local voltage, the smart inverter will inject reactive power. By acting in this manner, the voltage is kept within acceptable limits. The inverter can provide reactive power by utilizing available capacity or by decreasing active power production once the capacity of the inverter has been reached. The Volt-Var function may have a significant positive impact on mitigating DER grid integration costs.

5.1.2.3 (Active power control mode) Contstant active power control

In this mode, the active power will be the same as active power setpoint, unless the reactive power setpoint contradicts with the active power

5.1.2.4 (Active power control mode) Volt-Watt control

In this mode, the base active power will be specified by active power setpoint, however, the active power output will be linearly reducing if the grid voltage exceeds assigned threshold. The linear slope can also be assigned.

5.1.2.5 (Active power control mode) Frequency-Watt Control

In this mode, the base active power will be specified by active power setpoint, however, the active power output will be linearly reducing if frequency exceeds assigned threshold. The linear slope can also be assigned.

5.1.2.6 (Active power control mode) Volt-Watt and Frequency-Watt control

In this mode, the base active power will be specified by active power setpoint, however, the active power output will be linearly reducing if either frequency or grid voltage exceeds assigned threshold. The linear slope can also be assigned.

5.1.3 Ramp rates

5.1.3.1 Soft-start ramp rate (SS)

To avoid impact to the grid during the grid restores from a blackout or abnormal. the SS ramp rate will be implemented to make sure the active power setpoint will be slowly and linearly increasing when inverter reconnects to the grid.

5.1.3.2 Normal ramp rate (RR)

Similarly, to avoid impact to the grid during normal operation, the RR parameter will be utilized to make the change of active power is not transient.

5.1.4 Grid Forming

5.1.4.1 Stand-alone mode (V-F mode)

The V-F control mode is that no matter how the inverter power change does, the amplitude and frequency of output voltage would be constant, the inverter of V/F control can provide voltage and frequency support for the micro-grid during islanded operation.
The inverter will act as a voltage source. And the current amplitude and PF will be determined by the vector sum of the generation (if exist) and the consumption load.

5.1.5 Anti-Islanding

Anti-islanding protection is a safety feature that is built into all grid-tied inverters that operate in the US. It may not be built into some inverters meant to operate in different countries.

Anti-islanding protection is a way for the inverter to sense when there is a problem with the power grid, such as a power outage, and shut itself off to stop feeding power back to the grid. This is because when problems arise with the power grid it is assumed that workers will be dispatched to deal with the issue, and they want the power lines to be completely safe, and not have electricity flowing from all the nearby grid-tie systems.

5.1.6 High/Low voltage frequency ride-through

Ride-through is a state or action in response to an abnormal excursion of the grid, such as high/low voltage and high/low frequency, in which the inverter does not trip in less than the minimum specified duration.

Voltage and frequency ride through functions are the most important features needed to improve grid stability.

Historically inverters were programmed to get offline quickly in response to grid voltage or frequency excursions.

Container Layout

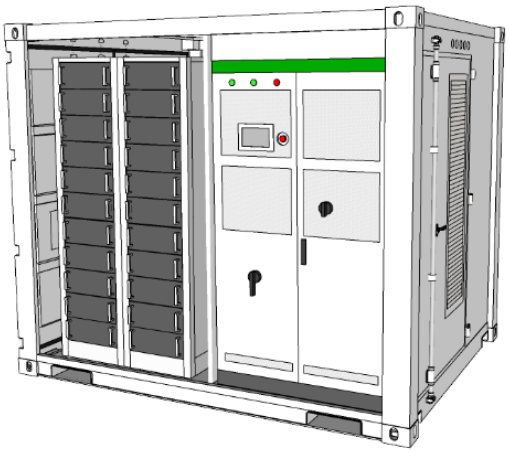


Figure 1 Layout of 10ft container

Figure 2 Layout of 20ft container

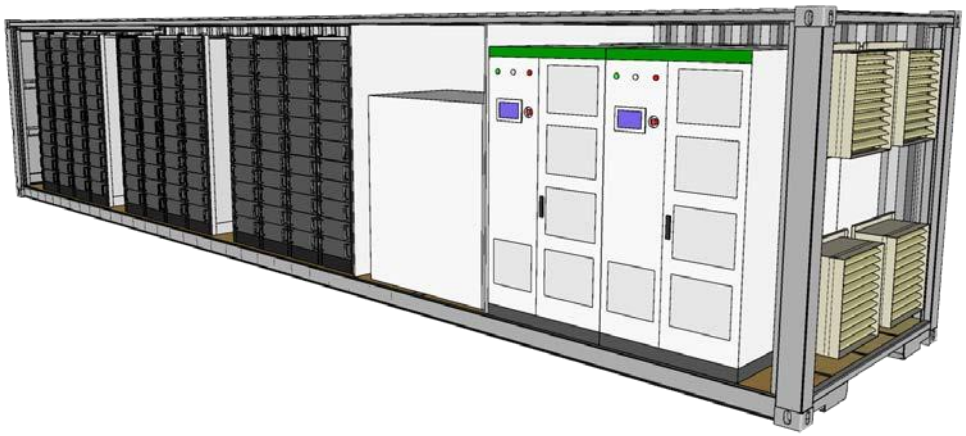


Figure 3 Layout of 40ft container

The highly customized intermodal container will be provided by Zhyphen to make an enclosure of the energy storage system, with the protection class of NEMA 3R.
The dimension of the container will be the same as standard or high cube 20ft container depending on the battery.
Depending on the scale, the container is divided into several rooms

6.1 40ft container

6.1.1 Battery room

The battery room takes most of the spaces in the 40ft container, the battery room is cooled by 2 air conditioners.

The battery room is divided into 2 symmetrical rooms, each room will be cooled by one air conditioner. There is one air duct on top of each battery room, delivering the cooled air to the top of the battery racks.

6.1.2 Inverter room

The energy storage inverters will be mounted in the inverter room.

The inverters are cooled by forced air, the cool air is sucked from the front of the inverter, and the heated air exhausts via the rear of the inverter.

Centrifugal fans are used to pump the heated air out of the inverter room.

6.1.3 Transformer room

There is a transformer room opposite the inverter room. Half will be occupied by the transformer.

Half of the transformer room will be occupied by fire suppression systems and other parts such as EMS if practicable.

6.2 20ft container

6.2.1 Battery room

The battery room takes most of the spaces in the 20ft container, the battery room is cooled by 2 air conditioners.

The battery room is divided into 2 symmetrical rooms, each room will be cooled by one air conditioner. There is one air duct on top of each battery room, delivering the cooled air to the top of the battery racks.

6.2.2 Inverter room

The energy storage inverter will be mounted in the inverter room.

The inverter is cooled by forced air, the cool air is sucked from the front of the inverter, and the heated air exhausts via the rear of the inverter.

Centrifugal fans are used to pump the heated air out of the inverter room.

6.2.3 Transformer room

There is a transformer room opposite the inverter room. The bottom half will be occupied by the transformer.

The upper half of the transformer room will be occupied by fire suppression systems and other parts such as EMS if practicable.

6.3 10ft container

6.3.1 Battery room

The battery room takes most of the spaces in the 10ft container, the battery room is cooled by 1 air conditioners.

6.3.2 Inverter room

The energy storage inverter will be mounted in the inverter room.

The inverter is cooled by forced air, the cool air is sucked from the front of the inverter, and

the heated air exhausts via the rear of the inverter.
Centrifugal fans are used to pump the heated air out of the inverter room.

Transformer

7.1 40ft container

7.1.1 PWS1-500K-NA

A 380(400)V:480V delta-wye transformer, up to 2000kVA rated, will be preinstalled in the container transformer room.

7.2 20ft container

7.2.1 PWS1-50/100/150/250K-NA

These models of inverters have built-in transformers. the transformer room will be free from a transformer.

7.2.2 PWS1-500K-NA

A 380(400)V:480V delta-wye transformer, up to 500kVA rated, will be preinstalled in the container transformer room.

7.3 10ft container

NO transformer room is available in designing in 10ft container

7.3.1 PWS1-50/100/150/250K-NA

These models of inverters have transformers built in,

7.3.2 PWS1-500K-NA

There is not enough room for preinstalling a transformer in it. An external 380(400)V:480V delta-wye transformer, rated 500kVA should be deployed separately at the site.

Air conditioner

The energy storage inverter does not require an air conditioner system itself, yet the LFP battery will require an air conditioning system to keep the internal ambient temperature stable. In some states in the United States, the air conditioner cannot be preinstalled on the container but must be installed by qualified entities.
The air conditioner(s) will be installed at the rear of the container. Two air conditioners should be implemented.
The recommended model is BARD W36A2/L2-C for 20ft/10ft container, and BARD W72A2/L2-C for 40ft container

Communication topology

Since there's no common BMS standard protocol in the industry, every manufacturer has a private protocol.
To make a standardized product, adapting the BMS protocol into the PCS, customizing PCS software to transfer the BMS messages to EMS is NOT supported by Zhyphen.
The BMS shall communicate with EMS directly, while PCS communicates with EMS separately.

However, a local gateway, or named SMS (storage management system) can be an optional part vended by Zhyphen, for acting as the protocol joint access point, integrating the BMS and the PCS to be one entity from the perspective of the EMS.

Seismic

The system is designed consulting *IEEE 693-2005: IEEE Recommended Practice for Seismic Design of Substations.*

Fire system

The civil administration may require a firefighting system to be preinstalled in the container system
The firefighting system will consist with local laws or regulations, specifically, NFPA regulations if the project is in the US, as well as UL standards on fire system.
The fire suppression system is meant to be procured by the integrator, or to be selected by Zhyphen.

Grounding

At least one grounding terminal is provided on the base of the container.
A ground rod is recommended to be buried as the grounding access point.
The rod shall not be less than 2.44 m (8 ft) in length and shall consist of the following materials.
(a) Grounding electrodes of pipe or conduit shall not be smaller than metric designator 21 (trade size 3/4) and, where of steel, shall have the outer surface galvanized or otherwise metal coated for corrosion protection.
(b) Rod-type grounding electrodes of stainless steel and copper or zinc coated steel shall be at least 15.87 mm (5/8 in.) in diameter
If practicable, the rod shall be embedded below permanent moisture level. Rod, pipe, and plate electrodes shall be free from nonconductive coatings such as paint or enamel.
The Concrete-encased electrode in the concrete base of the container shall be considered as part of the grounding system too.
The grounding conductor shall comply with the following table.

Size of Largest Ungrounded Service-Entrance Conductor or Equivalent Area for Parallel Conductors (AWG/kcmil)		**Size of Grounding Electrode Conductor (AWG/kcmil)**	
Copper	Aluminum or Copper-clad Aluminum	Copper	Aluminum or Copper-clad Aluminum
2 or smaller	1/0 or smaller	8	6
1 or 1/0	2/0 or 3/0	6	4

2/0 or 3/0	4/0 or 250	4	2
Over 3/0 through 350	Over 250 through 500	2	1/0
Over 350 through 600	Over 500 through 900	1/0	3/0
Over 600 through 1100	Over 900 through 1750	2/0	4/0
Over 1100	Over 1750	3/0	250

Appendix I Acronyms

AC: alternative current.
DC: direct current.
ESS: energy storage system.
EMS: energy management system.
BMS: battery management system.
FOB: free on board
PCS: power conversion system.
SLD: single line diagram
SMS: storage managing system
SOH: state of health (of battery), expressed in percentage.
DDP: Delivered Duty Paid
DOD: depth of discharge, the rest battery capacity, expressed in percentage.
EOD: end of discharging.
SOC: state of charge (of battery).

Appendix II Container System Naming

The Zhyphen container energy storage solution names as follows:

SES-[AA]-[BBB]-[CCC]-[DDDD]

SES: Energy Storage (Solution)
A: container size, 1 digit, or 1 digit with 1 letter suffix

1	10 feet
2	20 feet
4	40 feet
1H	10 feet HQ
2H	20 feet HQ
4H	40 feet HQ

B: Power Rating, 3 digits

code	Power Rating
101	10×10^{1}=100kW
151	15×10^{1}=150kW
251	25×10^{1}=250kW
501	50×10^{1}=500kW
102	10×10^{2}=1000kW

C: Energy Rating, 3 digits, not limited by the following table

code	Energy Rating
101	10×10^{1}=100kWh

151	15×10^{1}=150kWh
251	25×10^{1}=250kWh
501	50×10^{1}=500kWh
102	10×10^{2}=1000kWh
202	20×10^{2}=2000kWh

D: Project name or client name, no more than 4 letters.

Unit G, Aghanloo Industrial Estate, Limavady BT 490HE